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TECHNICAL REPORT

73-63-OR/SA

A MANAGEMENT INFORMATION SYSTEM FOR
A NEW SYSTEM OF CENTRALIZED PREPARATION OF
FOOD AND SATELLITE FOOD OUTLETS

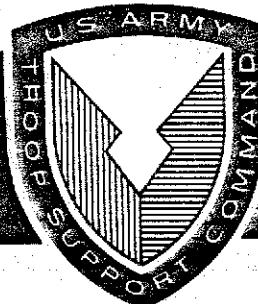
by

D. Paul Leitch

June 1973

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D. Paul Leitch

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13. ABSTRACT A new food service system has been proposed to attain two objectives: to increase and/or maintain high levels of consumer attendance and acceptance, and to reduce costs. Many menu items previously prepared in dining halls will be prepared centrally in a modern food preparation facility. Soiled dishware will be cleaned centrally. A new system of food outlets will be introduced which will include a variety of outlets such as regular meal facilities, short order facilities and specialty facilities. To direct the operations of the proposed system, management will require three types of information. First, performance reports are required for the Satellite and Central Preparation Facilities. Operational reports such as inventory status, production yields, purchasing and shipping records, and quality control reports constitute a second type of basic management information required to effectively operate the proposed system. Finally, the proposed information system contains planning and programming documents such as long term (1 year) food requirements, quality control trend analyses, and budgetary forecasts. With respect to automated data processing equipment and services, a 3-phase implementation plan is suggested. First, an automated headcount system and satellite performance reporting system would be made operational. Inventory and production control functions could be addressed in the second phase of the implementation plan. Quality control, long term forecasting, distribution and production scheduling are several aspects of the proposed information system which would be implemented in later phases as experience with prototype operations is accumulated and evaluated.			

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FOREWORD

In 1969 the DOD Facilities and Equipment Planning Board accomplished an on-site survey of military garrison feeding facilities in the United States. As a result of this survey, this Board created, with DOD and Army approval, a project to study, define, and then implement a new, modern food service system at Fort Lewis, Washington. The objectives were to improve performance and reduce costs. This system would then serve as a model for all military services.

In 1970 the DOD Food Research, Development, Testing and Engineering Program was established at Natick Laboratories. Included within this program were an increased emphasis on garrison food service systems and a requirement to apply a "total systems concept" in design of new military food service systems. This new requirement was implemented by the Operations Research and Systems Analysis Office at Natick Laboratories, and resulted in a rather unique but logical merger of the R&D systems study effort with the DOD and Army project to study and then implement a modern food service system at Fort Lewis.

The overall study effort was initiated in November 1970, under Project Number 1J662713AJ45, Systems Studies in Military Feeding. The purpose of this study effort was to develop a modern food service concept which would increase customer satisfaction and reduce operating costs, in that order of importance.

Due to the extent and complexity of the data which has been gathered, this report focuses upon the management information requirements in the proposed food service system, and is only one of several which have been published concerning the different aspects of the overall study effort. A list of these reports is provided below.

Natick Laboratories

Report Number

Title

72-37-OR/SA

A System Evaluation of Army Garrison Feeding at
Fort Lewis, Washington

*Superscripts denote references

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Natick Laboratories
Report Number

Title

72-43-PR	The 1971 Fort Lewis Food Preference Survey
72-44-PR	Fort Lewis Dining Facilities Consumer Survey ¹
72-48-FL	Fort Lewis Experiment Application of Food Technology and Engineering to Central Preparation
72-47-OR/SA	An Evaluation of Selected Advanced High Production Feeding Systems
72-48-OR/SA	An Analysis of Consumer Responses to Proposed Changes in Army Garrison Feeding System at Fort Lewis, Washington
72-56-OR/SA	A Qualitative Evaluation of the Environment and Modernization Potential of Dining Halls at Fort Lewis, Washington
72-64-PR	Consumer Reaction to the Fort Lewis CAFE System
72-67-OR/SA	A Cost Analysis of Modern High Production Food Service Systems for Military Garrison Applications
73-10-OR/SA	A Proposed Modern Food Service System for Fort Lewis, Washington ²
73-11-OR/SA	An Automated Headcount System

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ABSTRACT

A new food service system has been proposed to attain two objectives: to increase and/or maintain high levels of consumer attendance and acceptance, and to reduce costs.

In order to attain the above objectives, the proposed system incorporates several "new concepts" not found in the present food service program. Many menu items previously prepared in dining halls will be prepared centrally in a modern food preparation facility. Soiled dishware will be cleaned centrally. A new system of food outlets will be introduced which will include a variety of outlets such as regular meal facilities, short order facilities and specialty facilities. Dining halls, currently the responsibility of unit commanders would be incorporated into a new organizational element — the Directorate of Food Service. Individuals now assigned to a single facility would be allowed access to any facility of their own choosing. This "free access" concept would permit individuals to use the facility nearest their work or living areas which under current policy is sometimes rather difficult. A new highly selective menu will be offered throughout this system which will be driven by customer demand statistics so that over production will be reduced and runouts of favorite items controlled.

To direct the operations of the proposed system, management will require three types of information. First, performance reports are required for the Satellite and Central Preparation Facilities. Satellite performance can be assessed with attendance, cost and quality control/service criteria. The attendance and cost data of individual dining halls will be recorded and compared. Dining hall managers with high attendance and low cost per meal fed should derive some satisfaction from being among the top performers and having this position known to all who read the performance report. Conversely, the managers with low attendance and high costs per meal can be subjected to corrective action, or in extreme cases, the food outlet could be closed in favor of nearby successful facilities. Performance of the Central Facility would be reflected in variances between expected and actual production yields and costs. Operational reports such as inventory status, production yields, purchasing and shipping records, and quality control reports constitute a second type of basic management information required to effectively operate the proposed system. Finally, the proposed information system contains planning and programming documents such as long term (one year) food requirements, quality control trend analyses, and budgetary forecasts.

With respect to automated data processing equipment and services, a three-phase implementation plan is suggested. First, an automated headcount system and satellite performance reporting system would be made operational. This first phase is a logical first step since it can be implemented prior to construction and implementation of central preparation activities. Also, an automated headcount system is necessary in early system operational phases to provide an accurate auditable trail under the free choice food outlet system. This system will also provide the necessary data in determining production and inventory requirements consistent with consumer demands. The inventory and production control functions could be addressed in the second phase of the implementation plan. Quality control, long term forecasting, distribution and production scheduling are several aspects of the proposed information system which would be implemented in later phases as experience with prototype operations is accumulated and evaluated.

INTRODUCTION

Evidence accumulated in several recent studies has shown that a new approach is required in order for the Army Food Service program to meet the needs of modern military consumers. Consumer surveys¹⁻² have documented several problem areas in the present food service program and defined those changes which will improve food service for the customer. Improving the quality, increasing the variety of foods served and giving the customer a choice of different types of food outlets are three examples.

Analyses have shown that a central food preparation/warawashing system, in addition to solving the quality and variety problems, is a desirable economic alternative to the present program, wherein nearly all food preparation, requisitioning, sanitation, and accounting functions are performed by personnel in unit-size facilities. The proposed central food preparation system has been described in several preceding reports.³

Changes such as those proposed to feed the modern military consumer require new organizational relationships, techniques and management tools. For example, this new system of food service must be motivated and dedicated to meet consumer requirements. In commercial food service establishments, responsiveness to the consumer is achieved by the profit motive which is self-policing. Either a commercial facility attracts enough customers and keeps costs below prices or it closes. This profit motive and its self-policing aspects which have been missing in military food service are major contributors to mediocre performance achievements and decreasing customer trends in military dining halls. This report presents an approach to a new management information system which will require military food service managers to be measured and compared by numbers of customers they attract and cost per meal fed. This type of system will stimulate a pseudo profit motive which will require a redirection of management interest to the consumer's needs.

This approach also includes all other ingredients of a modern management information system to monitor and control the operational interfaces between a centrally managed system of food service which includes a large central preparation and warewashing facility and numerous satellited food outlets.

Objectives: Information systems are designed to facilitate the management decision-making process. Such decisions are, in turn, made to reach certain objectives. As stated in AR 30-1, "The Army Food Service Program",⁴ the broad objective of the present program is stated as follows:

"The Army program will insure efficient and effective use of personnel, material, and financial resources to provide the highest standards of food and food service."

Stated at this general level, the present program's objectives are identical to those of the new system. At operational levels, however, there are differences between the present and the proposed systems. Of eight specific objectives stated in AR 30-1, two stress fiscal accountability while the remainder pertain to training, civilianization programs, research, facilities and equipment. Of particular importance is the absence of specific consumer objectives. Such objectives as high attendance or consumer satisfaction are apparently assumed outcomes if the "highest standards of food and food service" are achieved.

The major problem associated with the existing system is that continuous and/or effective monitoring of "highest standards of food and food service" is impossible because of the difficulties associated with establishing realistic food service standards and evaluation of dining hall performance against these standards. Therefore, in the real world situation high performance is not achieved and/or maintained and mediocre performance results, which seriously lowers customer attendance rates. This mediocre performance level has been documented in numerous consumer survey reports, two of which have been cited on page 1. Since it has been documented that attendance is significantly affected by performance of individual food outlet managers and workers, actual attendance rates and trends in individual dining halls can be used as direct measures of actual dining hall performance. This will be particularly effective in an open access system which allows consumers to pick their individual facilities. With this emphasis, the management information system described herein will turn the above assumption around. Management will stress and reward higher attendance rates and can, except for extenuating circumstances, be reasonably confident that high performance is being maintained when attendance rates are high. The ultimate benefactor in this case will be the consumer.

It is also important to note that ration control and accounting are emphasized to a greater extent than are food quality and service objectives: at least if the number

of standards in each area is an indication of emphasis. Current objectives appear, in other words, to encourage greater concern for counting and controlling raw ingredients than for preparing and serving appetizing food and meeting consumer requirements.

As mentioned above, a basic premise underlying the development of the proposed system is that it be oriented toward, and responsive to, the military consumer while at the same time being responsive to controlling costs. Therefore, the objectives of the new system can be stated as follows:

- (1) To provide uniform high-quality food and improved service to the military customer, thereby increasing attendance and/or maintaining high attendance rates.
- (2) To achieve savings in manpower and related costs.

So that management can meet these objectives, several factors must be considered in the development of an information system. The obvious starting point is to determine what information is required at each level and position of management. For management to identify appropriate courses of action or apply controls before problems get out of hand, consideration must be given to the timing of reports. How the information should be presented and what levels of analysis should be performed on raw data are two additional matters of importance. Finally, consideration should be given to personnel, equipment, and policies required to produce the desired information.

Scope. This report is by no means intended to be a complete and detailed description of all information requirements in the proposed system. Rather, the primary emphasis will be placed upon system outputs — the reports which management will require in attaining and maintaining such operational objectives as high attendance, customer acceptance and high food quality at reasonable cost. Once the information system's outputs are explicit and agreed upon, the methods and equipment, inputs, and file structures, can be more easily determined. Focusing first upon system outputs has the further advantage of increasing the probability that files and procedures are organized to serve rather than dictate management's information requirements.

Basic Concepts in the Proposed Food Service System: The requirements of an information system are determined by operating policies and procedures as well as overall objectives. By summarizing differences between the present and proposed food service systems, a clearer understanding of new information requirements may result.

First, the proposed food service system will allow consumers to eat in any dining facility of their choosing. Presently, individuals are assigned to one dining facility and usually cannot eat in others. The "free access" concept places somewhat different and perhaps more difficult requirements on an information system than does the present dining hall assignment concept — particularly in the areas of demand forecasting and ration accounting. But more importantly, the consumer's freedom to choose where he eats should introduce an element of constructive competition for customers. A manager who offers good food amid pleasant surroundings would no longer be constrained by an artificial ceiling defined as the number of individuals in the unit assigned to his facility.

Second, the proposed food service system establishes a central preparation facility. Many food items now prepared in the dining halls would be prepared centrally. Material flow in the proposed system involves the central preparation facility in addition to dining facilities. This feature of the proposed system obviously requires some modification of present inventory accounting and control procedures, materials handling, and distribution.

With centralized preparation and storage, comes a requirement for rapid collection and analysis of quality control data. This requirement differs from the present food service needs principally in terms of the quantity of data collection and processing as well as the urgency of acting upon negative results.

The proposed food service system would also institute a limited self-service concept. At least on items of lower costs, consumers would be allowed to select as much or as little as they chose. This feature will place somewhat new demands upon inventory, production, and menu-planning activities in the proposed system as compared with the current program.

Finally the proposed system would consolidate the major components of food service under one Director. These components include a central food preparation/warewashing facility and satellite dining facilities. As will be shown in later sections, the proposed reorganization poses somewhat different requirements on existing organizational elements at local installations. Unit commanders, for example, may be relieved of the present requirement to audit dining hall records. While the proposed system maintains audit and accountability requirements, the reorganization shifts responsibilities for these functions, thus affecting personnel and workload requirements.

FUNCTIONAL ELEMENTS OF THE PROPOSED FOOD SERVICE SYSTEM

In this section, we will briefly describe the major activities and processes which characterize the proposed food service operations. Exhibit 2:1 (fold-out on page 13) presents the primary decisions and activities carried out in performance of five major functions: food preparation, requisitioning materials, storage and distribution, accounting and fiscal control, and inventory control.

Exactly how these functions are performed determines in large measure where, when, what kind of, and how much management information can be collected. An organization chart and brief statements describing the basic responsibility is presented in Appendix A. The following discussion assumes some familiarity with material in Appendix A.

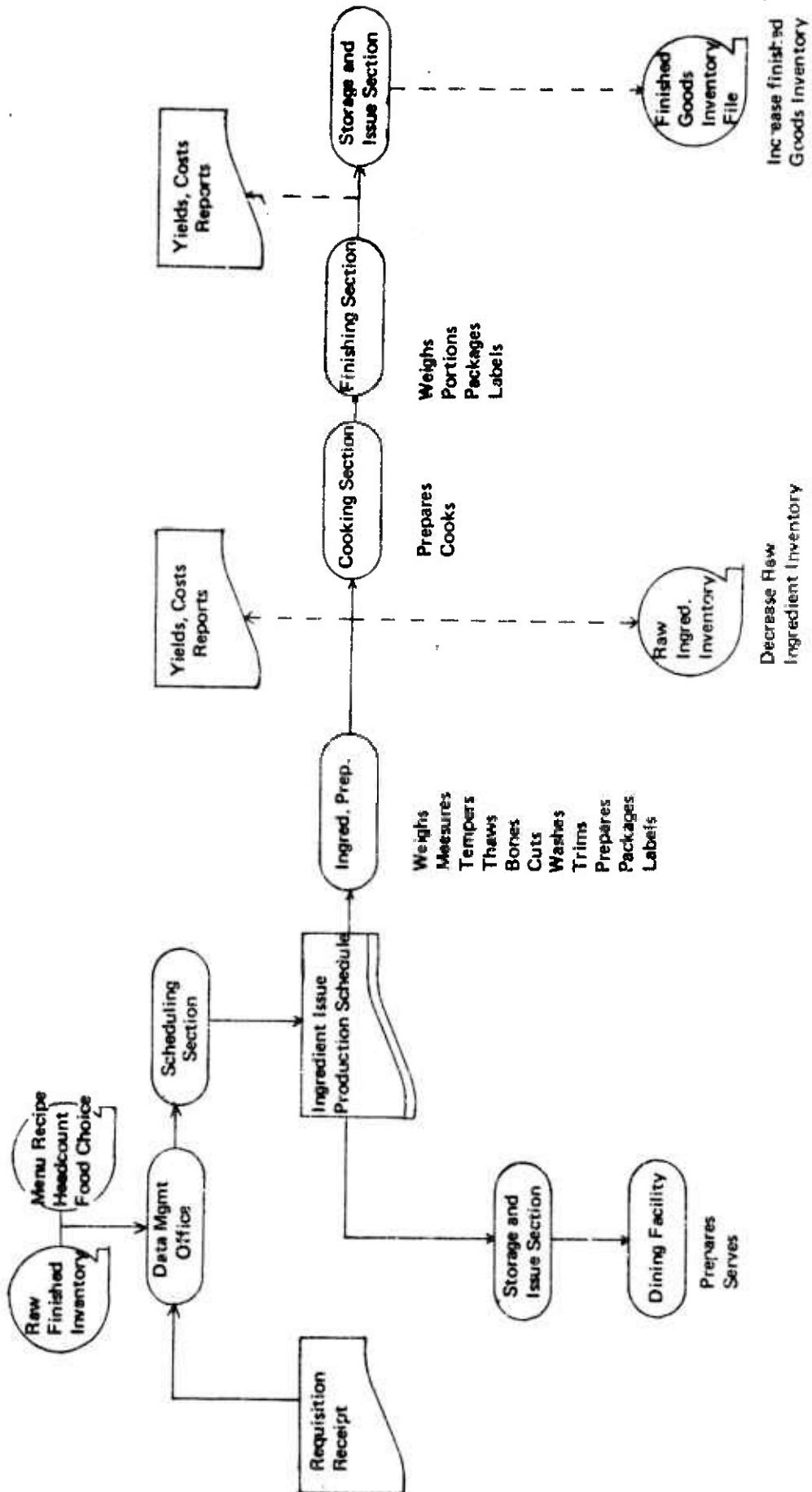
Food Production: The Central Preparation facility will produce virtually all of the labor intensive food items needed to meet the requirements of the military menu.

To achieve maximum efficiency and thereby minimize production costs in the CFPF, foods will be prepared in the largest possible production runs, usually in quantities sufficient to supply the demand for a particular product for a complete menu cycle. Batch sizes, of course, are limited by such constraints as storage space and equipment capacities. This creates a logistical and production scheduling problem which can best be solved with frozen foods. For this reason a majority of foods prepared in the CFPF will be frozen. Vendor supplied items such as bread, milk, frozen vegetables and frozen fish will be shipped directly to satellite dining halls without further processing in the central facility.

As indicated in Exhibits 2-1 and 2-2, the food preparation cycle begins with a production schedule developed in the Scheduling Section. Based on quantities specified in the schedule, raw ingredients move from storage into the Ingredient Preparation area. Raw ingredients and condiments will also be sent to satellite facilities since menu items such as hamburger will be grilled at the facility.

The primary function of the Ingredient Preparation operation is to assemble various raw ingredients, and from storage combine them according to specified recipes. Raw ingredients are received in bulk lots (e.g., cartons of beef and sacks of potatoes) and

EXHIBIT 2-2
FOOD PREPARATION FUNCTION



sent out in packaged amounts (beef stew ingredients combined). Thawing, cutting, weighing, washing, packaging and labeling are typical activities carried out in Ingredient Preparation operations. As shown in Exhibit 2-2, quantities issued to and sent from Ingredient Preparation can be utilized to compute costs and yields.¹

The Preparation Branch prepares and cooks all foods processed at the central facility. Raw ingredients, having been combined according to the recipe for each menu item, are received and placed into steam kettles, or ovens. Finished products will be sent out in bulk or liquid form. The latter, such as stews, soups, and gravies would be transferred directly from cooking pot to molds through gravity-fed tubes. Bulk amounts are carted or wheeled into the Portioning and Packaging area.

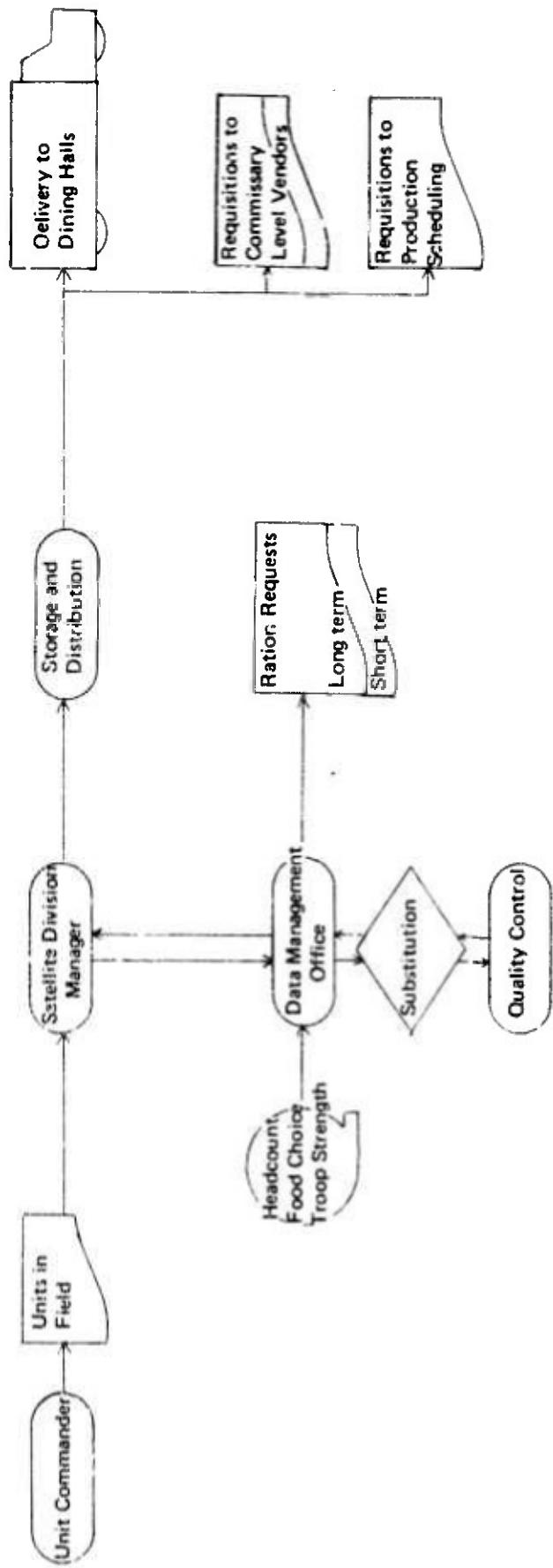
Portioning and Packaging's prime function is to subdivide production lots into smaller quantities and containers, label these containers, and assure that the expected portions are obtained. Weighing, packaging, and labeling are the main kinds of activities carried out in this section. In a strict sense, the food production cycle ends with the activities of this section. Food items are now ready to be shipped to satellite facilities or stored for later shipment.

While such activities as menu planning and recipe adjustments could be delineated as a separate function, they have been included in food preparation for simplicity's sake. The proposed system incorporates a Subsistence Review committee which will assure that menus are consistent with local preferences. The Data Management office provides significant support by means of periodic consumer surveys.

Requisitioning Ingredients and Materials. As shown in Exhibits 2-1 and 2-3, the Logistics and Satellite Divisions play a dominant role in determining how much food will be required and in assuring that sufficient quantities have been ordered.

¹ Raw Ingredient yield is simply the ratio between raw product weight and what remains after processing steps such as peeling. One hundred pounds of potatoes, for example, may "yield" 80 pounds of scalloped potatoes. The yield is usually expressed by a percentage — in this case, 80%.

EXHIBIT 2-3
RATION REQUISITIONING/DEMAND FORECASTING
FUNCTION



The Storage and Distribution section issues all requisitions for raw ingredients, finished products, materials, and equipment. Information needed to complete the requisitions is provided by the Satellite Division and the Data Management Office. When, for example, unit Commanders move their troops into the field, the Satellite Division Manager would be notified. The Satellite Division manager then notifies Storage and Distribution so that requisitions for finished products and raw ingredients can be correspondingly adjusted.

One of the differences between present and proposed requisitioning procedures involves a shift in responsibility. Currently, dining stewards prepare and submit ration requests. Under the proposed system, ration requests would be prepared by the Storage and Distribution Section (in conjunction with the Data Management Office) of the Central Preparation Facility. The ration order decisions made will be based upon automatically collected and analyzed customer demand statistics (sales data) which will accurately predict customer behavior in regards to attendance patterns and selections on the serving line offering a highly selective menu. Satellite managers would retain review and approval authority in regard to these decisions based upon their knowledge of troop movements and assignments.

It is important to stress that this recommended change is based upon actual experience with military food outlets within the Army and Air Force. The normal food outlet manager in military food service cannot accurately predict the number of and type of rations required to meet consumer demands in a system, such as that recommended in this report, which offers a highly selective menu. Experience gained in the early Fort Lewis CAFE environment demonstrated that dining stewards tended to run out of the more desirable menu items before a reasonable majority of customers were served. Without a proper statistical base (sales data) and control, a theoretically more desirable menu (multiple choice) becomes less desirable to the individual consumer who sees inequities of service within the actual dining area. Of equal importance in arriving at this decision was the knowledge that the automated headcount system which is necessary for audit purposes will provide as a fall-out benefit the capability to collect and record sales data in dining halls on a sampling basis which could be automatically processed to produce accurate ration requests. Based upon initial experiences gained in a test situation, it seems reasonable to assume that food outlet managers will be reluctant to cooperate with such a system when it is initiated, but will accept this system with open arms when the system proves that it can reduce their workload and provide more accurate estimates of future attendance and ration requirements.

In cases where requisitions cannot be filled with sufficient quantities of requested items, the Quality Control Section will determine appropriate substitutions in coordination with food outlet managers. This section will also sample and test raw ingredients or finished products received by the central and satellite facilities.

Exhibit 2-3 summarizes in flow chart form the requisitioning function. The primary activities in this function are determining the long and short range requirements for raw ingredients and finished products, preparing requisitions, substituting for unavailable items and issuing requisitions to appropriate sources of supply.

Distribution: Satellite facilities will receive shipments from either local vendors, the existing central storage facilities on posts, or the central preparation Storage and Distribution Section. Items will be delivered in chilled, frozen or ambient states.

According to a pre-prepared distribution schedule, materials are withdrawn from storage and consolidated into shipments for each dining facility. All items required by a particular facility would be "containerized" using, perhaps, stackable wire baskets. Items will be withdrawn from inventory on a "first-in, first-out" (FIFO) basis.

Inventory Control: One of the more important and troublesome of functions in the proposed system is inventory control. It is certainly one of the most extensive functions since it involves nearly every organizational element of the proposed system. Exhibits 2-1 and 2-4 summarize the activities required to perform the inventory control function.

Raw ingredients and finished products will be stored in chilled, frozen and ambient states. This is true in satellite as well as central storage facilities. Central facilities will hold enough material to feed troops through a complete menu-cycle (currently recommended to be twenty-one days). Satellite facilities will generally store sufficient material for three days' operation.

Maintaining sufficient, yet not excessive, inventories requires reasonably accurate demand forecasting particularly in the short term — 2 or 3 menu cycles. Inventory Control also requires identification of those items nearing their disposal dates. Once identified, items nearing the end of their shelf life can be reworked or issued ahead of schedule (assuming their expiration date occurs before the next appearance of the item on a menu).

EXHIBIT 2-4
INVENTORY CONTROL FUNCTION

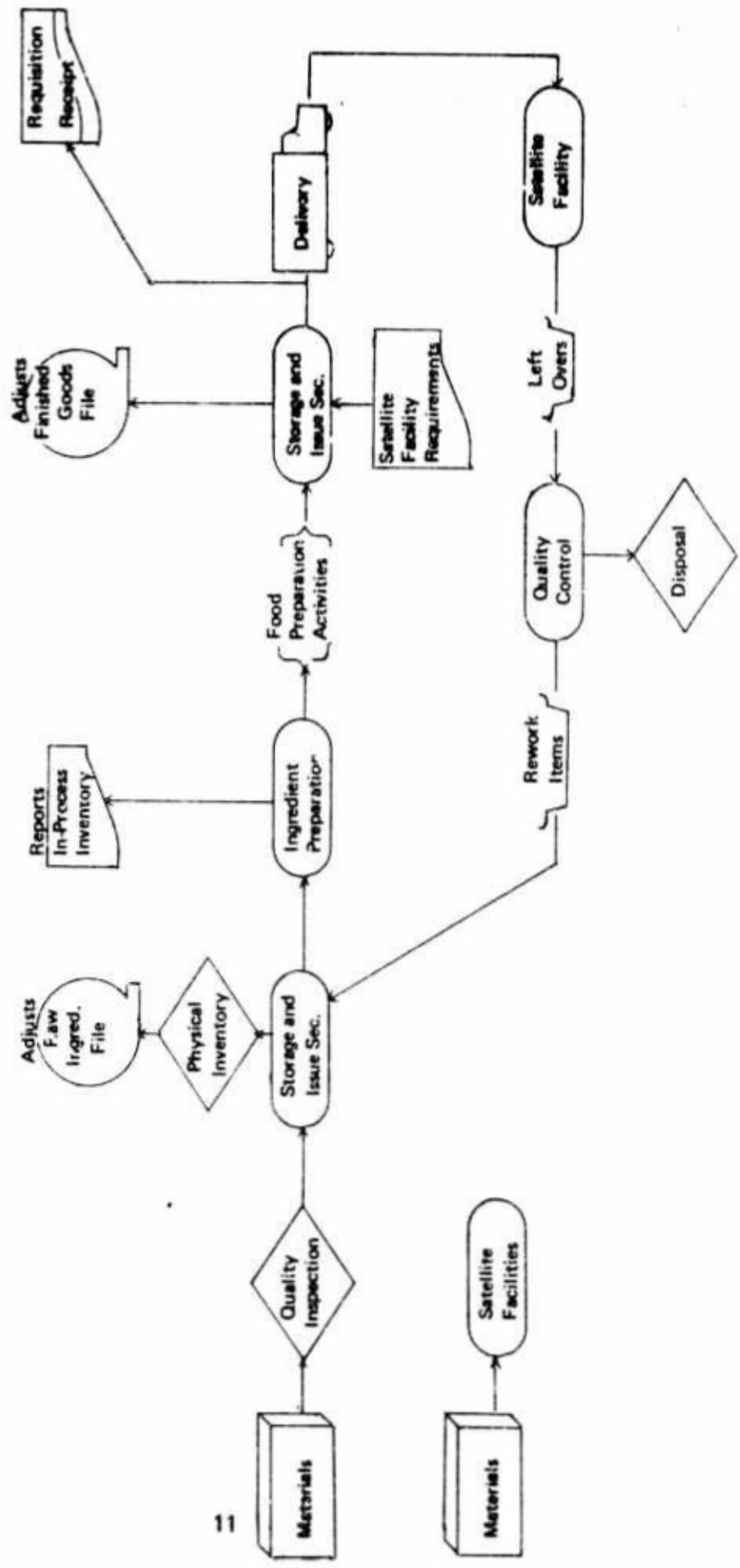


Exhibit 2-4 summarizes, in graphic form, the more important decisions and data required to maintain inventory control.

Accounting: The accounting function, broadly defined, requires such activities as recording headcounts at each dining facility, verifying quantities received and issued, and auditing satellite and central facility monetary records. Exhibit 2-1 summarizes the major activities required of each organizational element. Again, to present a broad overview, internal cost control has been incorporated into the general accounting function.

EXHIBIT 2.1

Summary of Functions Performed in the Proposed Food Service System

FOOD DIVISION

Ingredient

Preparation Branch

Scheduling

Section

Division Office Branch	Function	Summary of Functions Performed in the Proposed Food Service System			SATELLITE DIVISION Regular Food- Special Facilities Branch	LOGISTICS DIVISION Warehousing	SATELLITE DIVISION Regular Food- Special Facilities Branch	TECHNICAL SUPPORT OFFICE Microbiology Section	DATA MANAGEMENT OFFICE
Food Preparation	Plant and schedules food preparation activities and equipment.	Receives Ingredient Issue Slip. Prepares raw ingredients. Asssembles and sends raw ingredients to Preparation Branch. Verifies quantities received from Ingredient Prep and Nutritiion Branch when adjustments required. Supervises food preparation in satellite facilities.	Receives Production Schedule from Scheduling Section. Prepares and cooks all food items on schedule. Verifies quantities received from Ingredient Prep and Nutritiion Branch when adjustments required. Supervises food preparation in satellite facilities.	Receives Production Schedule and prepares food from Prep. Branch. Fills, portions, and weighs food into containers. Packages, labels, and freeze finished products. Sends prepared finished products to Logistics Division.	Forwards Production Record to Data flight. Checks all tools used prepared centrally. Recognizes all centrally prepared items. Maintains a dining preference evaluation system and makes corrective action where necessary.	Receives ingredients prepared foods, packages, all tools used prepared centrally. Conducts organoleptic tests and food taste panels.	Evaluates data collected by Data Manager. Conducts microbiological sampling and testing. Reports food preferences and food choices results to Quality Control Section. Performs Production scheduling and guides. Maintains Menu and Recipe files.	Conducts consumer survey. Reports food preferences and food choices results to Quality Control Section. Monitors cooking times and temperatures to assure that standards are being adhered to.	Conducts consumer survey. Reports food preferences and food choices results to Quality Control Section. Monitors cooking times and temperatures to assure that standards are being adhered to.
Accounting and Fiscal Control	Reviews costs of each production run. Notifies Chief Food Division of unusual cost variances.	Records amounts of raw ingredients required, processed, and sent to Prep. Branch.	Records amounts of raw ingredients required, processed, and sent to Prep Branch.	Records amounts of raw ingredients required, processed, and sent to Prep Branch.	Conducts periodic inventories to verify quantities on hand. Reports raw ingredients sent to Ingredient, Prep, and Satellite Facilities.	Receives raw ingredient and nutritional requirements. Requirements all food and material. Rates, requires long-term ingredient/retailers forecasts. Reviews long-term ingredient/retailers forecasts. Recommends changes to long-term ration requirements.	Receives notifications from UNIT commands. Inform Data Manager Office of non-ingredient feeding requirements. Reviews long-term ingredient/retailers forecasts. Recommends changes to long-term ration requirements.	Makes substitutions in raw ingredients/retailers. Inform director of substitutions to be made during budgeting. Imports raw ingredients.	Imports raw ingredients.
Regulating Raw Ingredients and Materials	Reviews ration requests and forecasts.	Reviews costs of each production run. Notifies Chief Food Division of unusual cost variances.	Records amounts of raw ingredients required, processed, and sent to Prep Branch.	Records amounts of raw ingredients required, processed, and sent to Prep Branch.	Receives raw ingredient and nutritional requirements. Requirements all food and material. Rates, requires long-term ingredient/retailers forecasts. Recommends changes to long-term ration requirements.	Receives raw ingredient and nutritional requirements. Requirements all food and material. Rates, requires long-term ingredient/retailers forecasts. Recommends changes to long-term ration requirements.	Receives notifications from UNIT commands. Inform Data Manager Office of non-ingredient feeding requirements. Reviews long-term ingredient/retailers forecasts. Recommends changes to long-term ration requirements.	Receives notifications from UNIT commands. Inform Data Manager Office of non-ingredient feeding requirements. Reviews long-term ingredient/retailers forecasts. Recommends changes to long-term ration requirements.	Receives notifications from UNIT commands. Inform Data Manager Office of non-ingredient feeding requirements. Reviews long-term ingredient/retailers forecasts. Recommends changes to long-term ration requirements.
Inventory Control	Conducts periodic physical inventories.	Reports ingredient inventories. Data Maint. Office of Inventory Adjustment.	Reports quantities of raw ingredients received from Ingredient Prep. Nutritiion Food Division manager when variance exceeds pre-determined amounts.	Reports quantities obtained in each production lot. Nutritiion Food Division manager when variance exceeds pre-determined amounts.	Reviews order point, lead time, safety stock levels. Receives raw ingredients. Receives finished products.	Reviews order point, lead time, safety stock levels. Receives raw ingredients. Receives finished products.	Reviews order point, lead time, safety stock levels. Receives raw ingredients. Receives finished products.	Conducts periodic physical inventories. Data Maint. Office of inventory adjustments. Assures that order items are bar-coded to central facility.	Conducts periodic physical inventories. Data Maint. Office of inventory adjustments. Assures that order items are bar-coded to central facility.
Distribution	Receives notice of delayed food delivery quantities to Satellite Facilities.	Receives notice of delayed food delivery quantities to Satellite Facilities.	Receives distribution documents from Data Maint. Office. Data required ratios from finished food and raw ingredients.	Receives delayed trays from Data Maint. Office. Returns sanitized trays, utensils, and other equipment to Storage. Consolidates items into shipment lots. Forwards shipping records to Data Maint. Office.	Receives delayed trays from Data Maint. Office. Returns sanitized trays, utensils, and other equipment to Storage. Consolidates items into shipment lots. Forwards shipping records to Data Maint. Office.	Receives delayed trays from Data Maint. Office. Returns sanitized trays, utensils, and other equipment to Storage. Consolidates items into shipment lots. Forwards shipping records to Data Maint. Office.	Receives delayed trays from Data Maint. Office. Returns sanitized trays, utensils, and other equipment to Storage. Consolidates items into shipment lots. Forwards shipping records to Data Maint. Office.	Receives storage facilities and delivery vehicles. Monitors temperature in storage facilities and delivery vehicles. Maintains all food handling equipment and containers. Implements corrective action when performance deviations are detected.	Receives storage facilities and delivery vehicles. Monitors temperature in storage facilities and delivery vehicles. Maintains all food handling equipment and containers. Implements corrective action when performance deviations are detected.

MANAGEMENT REPORTS

One of the serious problems in military food service has been the lack of a profit motive which is self-policing and requires a successful commercial manager to be directly concerned with the number of customers and costs per customer. Combinations of low attendance and high costs per customer force commercial restaurants to close. The establishment of a competitive system of food outlets and officially reporting and comparing food outlet managers on numbers of customers and costs per meal will provide a substitute for the profit motive. Empirical support has been found for the proposition that individuals have a basic need to evaluate themselves with respect to their abilities and their opinions.⁵ Motives such as the need for achievement, self-esteem, and recognition have also demonstrated positive relationships with job performance.⁶ A performance report that shows each dining steward where his operation stands in comparison with other food outlets will stimulate higher performance by appealing to such needs as self-evaluation, recognition and esteem.

The policy of reporting and comparing each food outlet on costs and customers, if aggressively pursued, will also allow management to control overall system performance. As occurs in private industry, dining halls which have low attendance and high costs can be closed in favor of other competing outlets.

Many different kinds of management reports are required in controlling the activities on-going in a large food service system. It may be useful, therefore, to classify management information requirements into three types:⁷

1. performance — results of operations
2. operational — status reports
3. forecasts — future requirements

Performance reports permit managers to assess the results of operations in the satellite and central facilities. Attendance rates are a measure of the performance of a satellite facility — although the present food system does not routinely report these figures at the dining hall level. Production costs would be appropriate criteria with respect to the central facility's performance.

Operational reports simply summarize the status of events at a particular time. Inventory reports are, by this definition, operational reports since they summarize the amount of product on hand or on order. They are, in other words, documents that provide management with information required to control operations, adjust plans, or to identify existing problems.

The third kind of information is represented by forecasting documents. Whereas performance and operational reports describe what *has* happened, forecasting reports and projections serve to direct attention to future requirements and contingencies. Headcount projections, for example, define raw food requirements in the coming months of operation. Such projections may also stimulate a search for problems and solutions when and if headcounts are in a declining trend while troop strengths are remaining constant.

Figure 3-1 summarizes the types of reports required in the proposed system and suggests the kinds of data files required to produce the specified reports. Appendix B contains a brief list of the kinds of data which would be incorporated in the input files.

Performance Reports: In order for military consumers to receive high quality food service at the serving line, management of the proposed system must assure that:

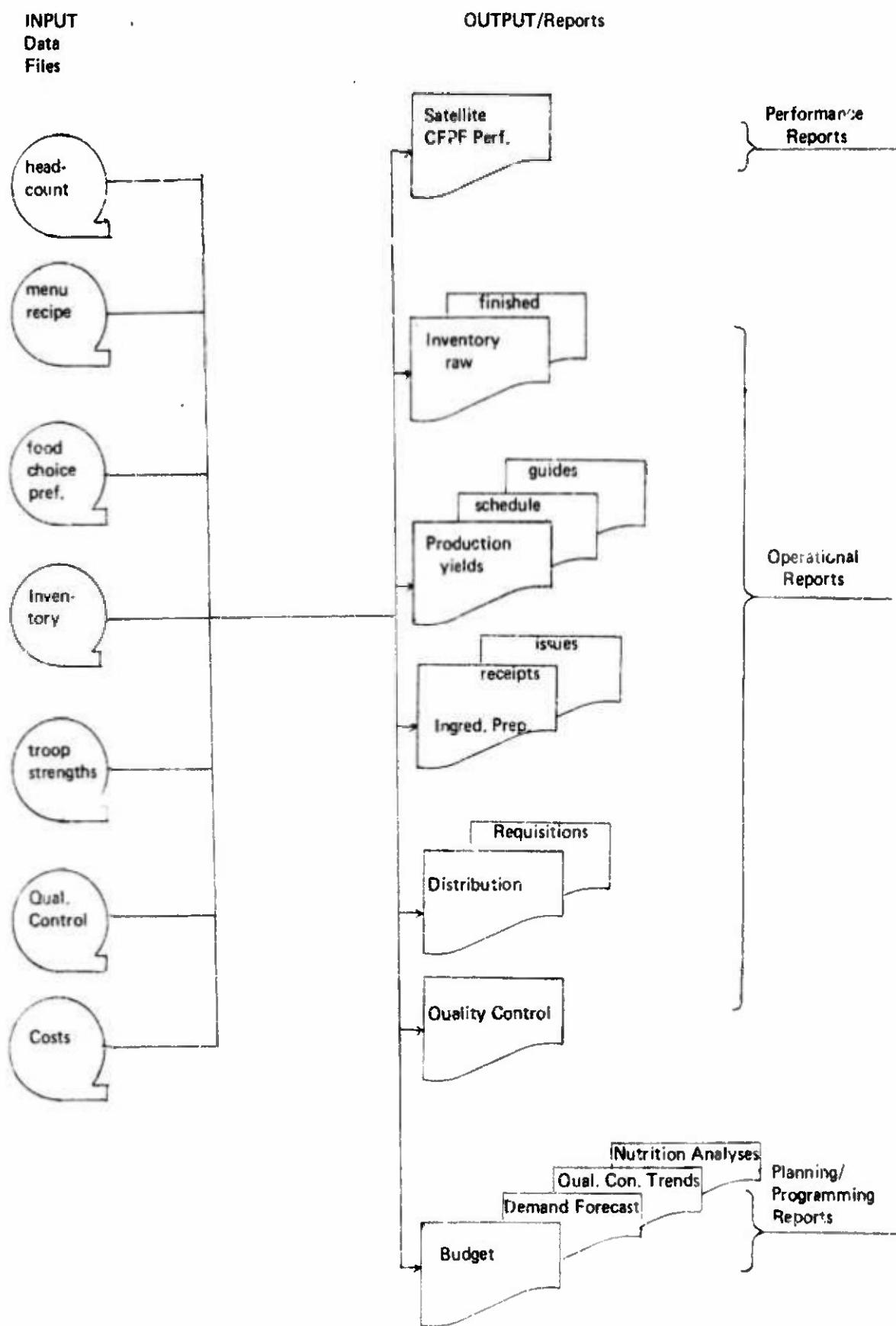
1. A large variety of high quality items are *delivered* to Satellite facilities, and
2. that those items are effectively served in the different type Satellite facilities at times and in amounts which meet customer requirements.

Effective management of the proposed food service system depends upon reliable and accurate information with respect to performance in both central and satellite facilities.

Satellite facility performance can be measured by:

1. Attendance rates
2. Costs per meal

EXHIBIT 3-1
Major Inputs and Outputs



Attendance rates will furnish readily quantifiable data which relates directly to the above high quality service objectives. Except for extenuating circumstances, high attendance will represent good achievement of these objectives and low attendance poor achievement. Costs per meal fed will provide the fiscal control necessary to reduce waste and control inventories.

One format in which these measures could be reported is presented in Exhibit 3-2 "Satellite Facility Performance". Two features of this report are especially important.

First, the proposed document enables management to compare one facility with another. Implicit in concepts of "performance" is some type of comparison⁸ — against budgets, historical data or as in Exhibit 3-1, against other organizational units. The anticipated effect of encouraging comparisons among satellite facilities is increasing pressure for those at the bottom of the list to move upwards in terms of higher attendance and lower costs. A substantial body of research supports this expectation.^{9,10}

The second feature of a report along the lines suggested in Exhibit 3-1 is that attendance is made an explicit performance indicator. Experience has shown that the profit motive is a powerful motivational factor in commercial food outlets. In order to make a profit and continue in existence, commercial outlets must cater to consumer wants and preferences.

Military food outlets presently lack a motivational factor as powerful as profit. It is of utmost importance that a new food service system such as that proposed stimulates some other powerful motive in managers which will insure that consumer's needs are met.

The "free access" concept is proposed to give consumers the power of choice. A Satellite Facility performance report as shown in Exhibit 3-2 directs management's attention to the effects of consumer choices as reflected by such figures as attendance rates and units utilizing each facility. Granted this approach may not be as powerful as the profit motive. It is, at least, a significant improvement over existing practice wherein consumer choice is limited and performance differences between dining facilities can only be derived with some difficulty from several documents.

Finally, the performance report suggested in Exhibit 3-2 would present the cost per meal for each satellite facility. Without going into detail concerning how the cost should

SATellite FACILITY PERFORMANCE

FROM: 12 April 73
TO: 24 April 73

A-RATION FACILITIES	MARKET SHARE			CURRENT	COSTS	LAST	AVERAGE	CONSUMERS	
	CURRENT	LAST	AVERAGE					A CO. 1	864 ENG BN
3110	65%	61%	60%	(B) \$.25	\$.24	\$.21	\$.21	B CO. 1	864 ENG BN
				(D) \$ 1.00	\$.98	\$.80	\$.80	B CO. 1	864 ENG BN
				(S) \$.60	\$.98	\$.59	\$.59	A BTRY. 1	218 FA
				(B) \$.30	\$.28	\$.27	\$.27	A CO. 1	58 SIG BN
				(D) \$ 1.10	\$ 1.03	\$ 1.05	\$ 1.05	HQ CO. 1	68 FA
				(S) \$.70	\$.65	\$.60	\$.60	A BTRY. 1	218 FA
				(B) \$.20	\$.21	\$.20	\$.20	A TRP. 1	1/2 ACR
				(D) \$.92	\$.89	\$.87	\$.87	B BTRY. 1	218 FA
				(S) \$.46	\$.50	\$.41	\$.41	C CO. 1	58 SIG BN
 SHORT-ORDER FACILITIES									
2111	70%	65%	72%		\$.18	\$.20	\$.16	A CO. 1	864 ENG BN
								B CO. 1	58 SIG BN
								C TRP. 1	2/3 ACR
								HQ CO. 1	864 ENG BN
								HQ CO. 1	58 SIG BN
								A CO. 1	58 SIG BN
								176 SIG CP	16%
								HQ BTRY. 1	1/3 ACR
 SPECIAL FACILITIES									
3289	70%	75%	68%		\$.65	\$.60	\$.62	HO TPP. 1	3/3 ACR
								45 CFW CO. 1	4/18 FA
								A BTRY. 1	2/18 FA
								B BTRY. 1	2/18 FA

be computed, one point deserves emphasis. The central preparation facility's actual costs to produce a particular lot of a finished product should not be used as the cost of that product to the satellite facilities. The quality of raw ingredients accepted at the CFPF, spillage, wastage and similar factors will cause a product's cost to vary from one production run to another. To pass these variances on to satellite facilities is clearly unfair and could generate conflict between central and satellite managers. The cost of centrally prepared products should, therefore, be based on a standard cost system which equalizes cost between facilities.

Operational Reports: Such decisions as how much to produce or what to substitute for an out-of-stock item requires what has been categorized as "operational information". When faced with such decisions, a manager needs to know, for example, the quantities of raw ingredients and/or finished goods in storage.

Based upon experience gained during the CAFE experiment, many of the present DA Forms and the information required to produce them, are useful in the proposed system. Materials, for example, are currently requisitioned using DA Form 3161 "Request for Issue/Turn In". A computer produced version of DA 3161 as presented in Exhibit 3-3 can also be utilized to order materials in the proposed food service system. The point to be emphasized is simply that the proposed system does not impose extensive new information requirements insofar as operational data are concerned. With some exceptions, requisitioning, food preparation, accounting, inventory and distribution functions can be accomplished using existing forms and reports.

Two reports are, however, proposed to provide information not routinely available in the present system. Exhibit 3-4 presents a stock status report which would assist central preparation facility management in making such decisions as when to reorder items or what items are available to meet unusual requirements, (e.g. sudden influx of troops). The following pieces of information are of primary importance:

1. quantities on hand by menu item and/or ingredient Federal Stock Number.
2. number of days remaining on item's shelf-life
3. location of goods on hand.

The proposed stock status report is designed to direct management's attention to the amounts of items on hand, the cost of inventories, remaining days of shelf life, and the

RATION ISSUE SLIP	INSTALLATION	ORGANIZATION	ISSUE DATE			
CONSUMPTION DATE	04 APR 1095	EVENING MEAL 3				
MENU ITEM	EXPECTED PORTIONS	UNITS ISSUED	UNITS USED	UNITS RETURNED	UNITS ON HAND	MENU ITEM
ROTTED CARROTS	104	1	1	1	1	070:05
PAN ROLLS	179	1	1	1	1	130:32
PEANUT BUTTER COOKIES	221	1	1	1	1	170:40
STRAWBERRY GELATIN	171	1	1	1	1	190:10
CHEFS SALAD	132	1	1	1	1	270:70
COTT CHEESE & TOMATO SALAD	132	1	1	1	1	720:40
BAKED POTATOES	213	1	1	1	1	260:40
REQUESTED BY:	VERIFIED BY:	RECEIVED BY:				
ESTIMATED MEAL COUNT	260	MENU DAY 16	USING OUTPUT DATED	24 MAR 72		

20 APR 73

 **** STOCK STATUS REPORT ****
 **** **** **** **** **** **** **** ****

ITEM	DESCRIPTION	AMOUNT ON HAND	ON OPD	MIN LEV LBS	OVERAGE DATE 0A MO YR	USE DAYS REMAIN	% SHELF LIFE
		LBS	PU	LBS			
CSN	Q-1380 CHICKEN, OV FR	1500	300	1	\$ 368.40	23/05/73	30 75%
CSN	Q-0250 LASAGNA	562	112	1500	\$ 139.80	20/05/73	27 22%
CSN	Q-0250 LASAGNA	112	25	315	\$ 74.56	20/04/73	1 3%
CSN	L-2300 BEEF STEW	50	10	200	\$ 4.00	18/04/73	-35 ***
CSN	Q-1420 TURKEY	3750	750	10000	\$ 2900.00	15/05/73	22 55%
CSN	Q-1600 GRAVY, GRISLET	375	750	10000	\$ 50.00	15/05/73	22 55%
CSN	M-0080 COLE SLAW	625	125	5000	* 300.00	24/05/73	01 14%
CSN	I-0080 PIE, APPLE	2000	1000	8000	\$ 72.00	13/05/73	20 22%
CSN	I-0510 PIE, BANANA CR	2000	1000	8000	\$ 690.00	24/05/73	21 33%
CSN	K-0077 FRENCH TOAST	2400	1200	1	\$ 240.00	24/05/73	01 3%
FSN	151-6588 BEEF, OVEN ROAST	4500	12000	2	\$ 7700.00	31/01/74	252 69%
FSN	953-3268 BEEF, PATTIES			1500			
				(20/04)			
FSN	953-3268 BEEF, PATTIES	100	530	2	\$ 63.10		
FSN	616-0050 FRANKS	3125	2500	2	\$ 1933.00	25/04/73	103 57%
FSN	126-3406 CHEESE, COTTAGE	150		1	\$ 105.00	30/06/73	90 69%
FSN	126-3406 CHEESE, COTTAGE	500		3	\$ 350.00	25/04/73	92 29%
FSN	782-2837 CHEESE, MOZZARELLA	250		1	\$ 180.00	26/04/73	03 43%
FSN	043-3200 EGGS, SHELL	5100	2000	1	\$ 147.00	30/05/73	37 41%
FSN	043-3200 EGGS, SHELL	21000	8400	2	\$ 620.00	27/04/73	74 13%
FSN	043-3200 EGGS, SHELL	10000	4200	3	\$ 294.00	26/04/73	03 10%
FSN	126-4323 MILK, NONFAT DRY	150		1	\$ 147.00	01/08/73	100 27%
LVD	MILK, HOMO FORT	1800	8000	3	\$ 800.00	24/04/73	3 33%
FSN	164-4160 LETTUCE, HEAD	50		1	\$ 8.33	25/04/73	92 20%
FSN	164-4160 LETTUCE, HEAD			100			
				(20/04)			

status of items requisitioned but not received. Amounts are shown in terms of total pounds, production units, and servings. A location code would indicate whether the item was at Central Prep Storage (indicated by "1" in LOC column of Exhibit 3-4) or commissary or satellite storage facilities. "Overage Date" and "Use Days Remain" columns would direct attention to items which should be issued or possibly reworked. An asterisk — such as for Lasagna in "Use Days Remain" column — indicates items for which shelf life expires before the item's scheduled appearance on the menu. For certain items, management may establish a minimum stock level.

Management's use of the Stock Status report can be illustrated by a simple example. The Food Division Manager may find some morning that meat for the day's production has not thawed. Reference to the Status report can quickly identify possible substitutions for the scheduled item.

The "Production Report" presented in Exhibit 3-5 is designed simply to focus management's attention on variances between obtained and expected results. Finished product and raw ingredient yields are presented. Food Costs, with direct labor costs perhaps added in later system development, are presented in Exhibit 3-5 on a per thousand meal basis.

Each menu item centrally produced involves two types of "yield" information. First, given raw material of a specified uniform quality, the "expected" or "standard" yield can be computed. But each time that a menu item is produced, the yield may vary from the standard due to using lower (or higher) quality ingredients, to carelessness in preparation, or to substitutions made during the production run. These factors will operate and will require the computation of the second type of yield report — the "obtained" yields. Obtained yields for each production run can be compared with prior runs to identify possible production problems, support price adjustment requests, or to justify changes in the "standard" or expected yield for that product. Costs are included in the proposed report so management's attention and effort can be directed to solving the more important problems.

One other operational report should be emphasized. Production scheduling is an important function in both the present and the proposed system. As is currently the case, personnel, equipment and raw materials have to be coordinated daily to produce required menu items. A modified version of the "Ingredient Issues/Production Record" utilized during the CAFE operation at Fort Lewis is presented in Exhibit 3-6.

PRODUCTION REPORT

20 APRIL 1973

ITEM	DESCRIPTION	EXPECTED	YIELD		FOOD COST EXPECTED	FOOD COST CURRENT	OIL LABOR COST STANDARD	OIL LABOR COST CURRENT
			LAST	CURRENT				
CSN L1339J	CHICKEN, OVEN FR -1 CHICKEN, FRSN -2 FLOUR, WHEAT -3 BREAD CRUMBS -4 EGGS SHELL -5 MILK, NONFAT ORY -6 SPICES	67%	65%	69%	\$ 34.68	\$ 33.99	\$ 28.90	\$ 29.00
CSN L0250	BAKED LASAGNA -1 BEEF, GRO FZN -2 ONIONS, DRY CHP -3 SALAD OIL -4 TOMATO, PASTE -5 TOMATO, CANN -6 CHEESE, GRATED -7 CHEESE, COTTAGE -8 CHEESE, MIZARELLA -9 LASAGNA NOODLES -10 EGGS SHELL -11 SPICES	95%	90%	96%	\$ 24.47	\$ 23.58	\$ 20.39	\$ 21.00
CSN M0440	SPRING SALAD -1 LETTUCE FRESH -2 RAISINES FRESH -3 CUCUMBERS FRESH -4 PEPPERS FR. SWEET -5 ONIONS GREEN -6 TOMATO, CHER, FR	99%	98%	85%	\$ 7.34	\$ 8.55	\$ 6.12	\$ 6.00

INGREDIENTS ISSUE/PRODUCTION RECORD*

JULIAN DATE 092

ITEM: FRENCH TOAST
PORTION SIZE:
PORTIONS/PAN/PACK:
FULL: HALF:

29
29
29

PRODUCTION RECORD
PANS: FULL: B
HALF:

OTHERS

INGREDIENT

INGREDIENT	AS PURCHASED	EDIBLE AMT 300 PORTIONS	KITCHEN CHECK	WEIGHT PER UNIT	TOTAL WEIGHT	TOTAL COST
MILK, NONFAT DRY	24.00 OZ	24.00 OZ				
SALT	3.00 OZ	3.00 OZ				
SUGAR, GRANULATED	4.50 LB	4.50 LB				
WATER	6.75 QT	13.50 LB				
EGGS, WHOLE SLIGHTLY BEAT	31.50 DZ	37.50 LB				
BREAD, DRY SLICED	36.00 LB	36.00 LB				
SHORTENING, COMP	6.00 LB	6.00 LB				

CONKS/BAKERS INSTRUCTIONS

EQUIPMENT REQUIRED	TIME
MIXER	2 C. MIN.
BATTERING MACHIN	120 MIN.
OVEN	60 MIN.

LABOR REQUIREMENTS

—TOTALS

24

MAXIMUM BATCH SIZE = 300

Program and Planning Reports: Although less frequent than previously described outputs, the program and planning documents are important elements of the proposed information system. Whereas performance and operational reports are essentially historical, planning documents are future-orientated. The primary objective of "planning" or forecasting reports is to assist management in anticipating problems.

Budgets are a type of planning report. Given a combination of such data as prior headcounts, projected troop strengths, food preference factors, prior and projected production costs, it is possible for each Directorate to prepare a yearly budget. Upon review and approval by higher authority, the revised budget and overall attendance rates can become essentially a yardstick by which to evaluate performance at the Directorate level.

Quality Control analyses can also be considered as planning/forecasting kinds of information. Of the many problems that management must detect in their early stages, the major area involves food handling and storage in the central and satellite facilities. Within the existing food service system, food poisoning — when it occurs — may be limited to one dining facility. With the proposed centralized preparation system, the effect of contaminated food delivered to and/or used in dining facilities could obviously have much greater impact. Microbial counts, cooking times and temperatures in both the central and satellite facilities thus must be subjected to more than simple tabulations and reports of current conditions.

MAJOR INTERFACE ISSUES

The proposed central food preparation facility is a new element in the existing management structure. As such, it poses new problems and requires new relationships in terms of information flows within and between existing organizational elements.

This section will focus upon information flows between the proposed CFPF and existing organizational elements. The major interfaces are between CFPF and:

1. Commissary
2. Finance and Accounting
3. Unit Commands
4. Personnel and Adjutant General's Office
5. The Surgeon General
6. BASEOPS-MISO

Each of these elements/programs will require certain kinds of information from CFPF. And the CFPF will in turn require information or services from these elements.

Commissary: As the primary supplier of raw materials, the commissary is an important element in the proposed information network.

The Logistics Division, can furnish the Commissary with computer printed requisitions similar to the existing DA Form 3161 "Request for Issue and Turn In". These requisitions will specify the item, description and delivery dates. Their use will be restricted to short term requirements, e.g. material required within 7 days.

In order to assure that the CFPF receives the items it requires and in the order quantities specified, the CFPF could provide the Commissary with a quarterly material requirement document. The information in these documents could be derived from long term demand forecasts based upon expected attendance, portion sizes, production yields and the menu and existing inventory levels. It should be feasible to prepare a yearly requirement forecast so that the quarterly reports are primarily updates. Approximately one year will be required to accommodate the required data base and develop the specified forecasting model.

Finance and Accounting: The information exchange between the CFPF and post Finance and Accounting becomes an important issue, when, and if, cash collections are removed from the satellite facilities. The CFPF automated headcount system would produce a list of individuals and/or meal charges on cards or tape. Until such time as a preliminary evaluation to test a meal "credit card" concept is conducted, the specific information exchange between CFPF and Finance and Accounting cannot be fully described. It would not be difficult to report such data as the number of meals consumed by an individual during each pay period.

Unit Commands: The primary information exchange between the CFPF and unit commanders concerns attendance irregularities and unit strength data from the morning report.

In order to compute satellite facility attendance rates, the CFPF DFO must receive from unit commanders the following information daily:

1. total unit strength
2. total authorized separate rations
3. total on leave, travel status, all other absences
4. total authorized to be subsisted without reimbursement.

When the morning reports are computerized, the data can be retrieved by the CFPF via appropriate programs (software). In the meantime, the required data can be manually keypunched from existing DA 2970 forms. These documents will be sent directly to the CFPF DFO rather than through dining facility managers as is current practice.

Unauthorized access is the second primary information exchange between CFPF management and unit commanders. An automated headcount system will significantly increase management's capability to identify cases of potential irregularities in satellite facility headcounts. From the date, time, and location information automatically recorded when an individual's card is inserted into card readers, several types of potential unauthorized access can be uncovered. Two examples are:

1. cards appearing at two facilities at the same time (duplicated cards)
2. cards appearing at the same facility within several minutes (possible card "loaning").

Cases of potential unauthorized access will be listed in the "UNUSUAL USAGE" report, an example of which is contained in Exhibit 4-1. (This example presents data for one company at Fort Lewis, Washington during 15-31 March 1972). During the two-week interval, four meal cards appeared more often than might be expected — or authorized. Card number 345678912 may have consumed the two evening meals in 3114 represented by the appearance of his meal card in 3114, Monday, 27 March 1972. But another possibility is that his card was "loaned" to a friend.

These examples serve to illustrate the point that the proposed automated headcount system can only assist in identifying cases of potential misuse. Some kind of investigative or follow-on action must be initiated on the basis of this report.

Personnel/Adjutant General's Office: The primary information flow between the CFPF and AGO will be in the area of personnel actions such as changes in unit assignments and transferral from "rations-in-kind" to "separate rations" status. CFPF management will have to be integrated into the current information network at the earliest step. The Directorate of Food Management should, in other words, be included in the In-Processing Out-Processing procedures as individuals are assigned to or transferred from the installation. Experience gained with an automated headcount system during CAFE operations indicates that meal cards cannot be effectively controlled if changes in personnel data such as transfers from one unit command to another are delayed by the failure of commanders to report such changes to CFPF management.

Surgeon General's Office: The CFPF, through periodic consumer/food consumption studies will have the capability to produce nutritional intake reports of interest to the Surgeon General (SGO). If these reports would only contain nutritional profiles of military meals, they would provide more information than is routinely supplied by the existing information system.

The extent to which local installations will be allowed to propose or initiate menu changes will have some impact upon information flow between the SGO and central food preparation facilities. As yet, the specific requirements are undetermined.

BASEOPS Program: The proposed management information system when fully implemented may place a significant time requirement on the present BASEOPS system. In this report

UNUSUAL USAGE REPORT

PERIOD COVERED 19-31 MAR 72

864 ENG BN
22ND ENG CO

SOCIAL SECURITY NO	DAY	DATE	FACILITY	TIME
123456789	SATURDAY	18 MAR	3114	0800
			3114	0830
	SUNDAY	19 MAR	3114	0750
234567891	SUNDAY	26 MAR	3114	0850
345678921	MONDAY	27 MAR	3218	1949
456789123	TUESDAY	28 MAR	3114	1629
			3114	1700
			3218	1715
			3218	1757

it is not possible to provide a firm fixed requirement since many of the proposed programs and reports have not as yet been developed. Preliminary estimates based upon CAFE data presented in Exhibit 4-2 suggest that the CFPF requirements could reach two hours of system time per day, given the present BASEOPS configuration.

Exhibit 4-2

CHARACTERISTICS OF COMPUTER PROGRAMS
USED IN THE CAFE EXPERIMENT

Program	Language	Function	Core Used	Fort Lewis 360/30 Tape Drives	Harvard or Seattle IBM 360/50 Computer
IIPR ¹	COBOL	Production guides for food production	100 K	70 min (est.)	1.0 min
RIS ¹	COBOL	Distribution documents	80 K		.8 min
Headcount ¹	COBOL	Print "signature sheets"		13 min	
MENUAA ²	Fortran	Update menu/recipe file			1.8 min
UTLZTN ³	Fortran	Compute meal attendance rates and patterns	5B K		1.0 min
URPRT ³	Fortran	Print UNUSUAL USAGE REPORT	68 K		3.3 min

¹ These programs are run daily.

² This program is run whenever changes are made in the menu or recip

³ For 2 weeks of data approximately 20,000 records.

IMPLEMENTATION

To facilitate transition from the present to the proposed system, a phased implementation approach is suggested at least insofar as the information system is concerned. The purpose of this section is to outline one possible implementation plan based upon certain logical relationships between elements of the proposed information network.

Phase 1 – Headcount Function: For several reasons, the headcount system is a logical starting point in implementing the proposed information system. First, many operational decisions depend upon accurate headcount data. Scheduling, production planning, requisitioning are all dependent upon headcount expectations which in turn stem from past attendance figures. Second, given the objectives of customer service, attendance data is perhaps the most important measure of performance – certainly with respect to satellite dining facilities. Previous discussions do not require headcount data for CFFP performance measures. Early implementation of a headcount and attendance information subsystem may assure that consumer orientation becomes an integral aspect of the new system's operation. Finally, the headcount subsystem can stand as a relatively self-contained entity. Removing the signature requirement is, in some views, a rather separate problem from modernizing the food service system. Automated headcount systems could easily be implemented before operations in a new central preparation facility actually commence.

The software required to operate an automated headcount system is relatively less extensive and complex than that which would be required in the inventory control system, for example. At minimum, three programs would serve most requirements. One would produce attendance reports, another would produce unusual usage reports and a third would analyze past data to produce expected headcounts for production requirements.

Subsequently, the dining hall performance report could be added. At least with respect to attendance and cost measures, this report would be of considerable value in the present food service program. Perhaps the most important issue is whether to include costs as a measure of performance in the initial reporting system implementation. For reasons described earlier, the cost and accounting procedures should be evaluated carefully before costs are included as a measure of satellite facility performance. If satellite managers are to be held accountable only for factors which they can reasonably control, some means will have to be found to separate central facility preparation costs from costs at the satellite facility.

Phase 2 – Production and Inventory Functions: Implementation of the production and inventory reporting and control functions can be the focus of Phase 2. As with the headcount function, the production and inventory data collection and reporting procedures can be treated as relatively independent elements of the information system. At least initially, these documents and information flows can be contained within the Directorate of Food Operations. Interface problems can be minimized – restricted initially perhaps to ADP support from the installation Management Information Systems Office.

Ingredient preparation/production guides, yield reports, and inventory status reports would comprise the basic documents to be developed during this phase. The required software could be as few as three basic programs – some of which already exist. Some software developed during the CAFE operations at Fort Lewis would, for example, be applicable with but minor adaptions.

Phase 3 – Demand Forecasting and External Reporting Function: Several of the more complex aspects of the proposed information system may best be developed in the third phase of an implementation plan. Those aspects which require a substantial data base or which involve reports to, or require data from, other elements of Army management fall into this third phase. Long range demand forecasting, for example, may well require one year's headcount and food choice data before a useful prediction equation can be developed. Production and distribution scheduling may also require a substantial data base before really useful algorithms can be implemented.

SUMMARY

A new approach in garrison food service has been developed and subjected to a limited field test in the CAFE experiment at Fort Lewis, Washington. The new approach was developed to obtain high levels of consumer acceptance while reducing total costs involved in providing high quality food service to the modern military consumer.

Primary elements of the proposed food service system include centralized preparation and storage facilities. Central warewashing is another important facet of the proposed food program. Special facilities will be created wherein consumers can obtain highly preferred traditional and ethnic dishes in non-military surroundings. In the proposed system, consumers would be free to choose any dining facility in which to eat. Current practice assigns individuals to "unit" dining halls with prohibitions against eating in other unit facilities. It is also proposed that all food service activities be consolidated — at the installation level — under a Director of Food Management. Under this organizational plan, satellite dining facility managers would report to a division manager rather than to command unit officers as is presently the case.

The proposed changes in technology and organization present new information requirements. The reports, input data, and procedures now being utilized cannot provide all of the information required to manage the proposed centralized system. The existing information system if applied to the new food service system, might, in fact, divert management's attention from consumer-related concerns. When a basic measure of performance in the market place is omitted in a formal information network, management can hardly be expected to pay attention to consumers. And it seems fair to say that market performance measures are not a salient aspect of the present information system.

In outlining an information system appropriate to the new food service concepts, attention has been focused upon three types of reports required to direct the operations of the central and satellite facilities. Management information requirements can be categorized into three major areas; performance measurements, operational summaries, and forecasting/planning reports.

With respect to performance, perhaps the most crucial indicators are attendance rates and costs. The proposed food service system will be responsive to consumer demands only to the extent that management's attention is directed to market performance.

Two indicators of market performance are proposed. Attendance rate is one rather obvious measure. A second indicator is based upon units utilizing each satellite facility. With the free access concept, consumers will no longer be constrained to eat in a dining facility assigned to service one or more specific units. It can be anticipated that, in the proposed food service system, consumers will tend to use those facilities offering the most desired product. Reporting the percentage of consumers from units utilizing each dining facility is one way of tracing where individuals chose to eat with the assumption that including this information in a formal report can foster competition for specific segments (units) of the total consumer market. To the extent that competition focuses management attention upon attracting consumers, the objectives of the proposed food service system will be well-served.

Costs must also be included in measurement of satellite facility performance. Since much of the food preparation has been centralized, the computation of meal costs in satellite facilities must be given careful consideration. Cost variances incurred by poor management of the central facility must be isolated. To avoid "passing on" cost variation satellite managers cannot control, it is proposed that satellite facilities "buy" centrally prepared foods at an average or standardized cost.

Market and cost performance measures will be presented in a report format that facilitates comparisons between satellite facilities. All outlets will, in other words, appear on the same report. Management will be able to easily identify the highest and lowest performers. Accumulating research evidence indicates that the capability to compare one's own performance with others' performance has substantial and positive impact upon individual's motivation.

In the area of operational information, the proposed food service system poses few requirements that cannot be met with existing forms and procedures. Two types of information have, however, particular importance for management of the proposed system. Production yields and costs within the central facility will have to be computed and closely watched. For this purpose, a "Production Report" is proposed. This report would present raw ingredient and finished product yields and costs for each centrally produced menu item.

Inventory control in the proposed food service system will be facilitated by a proposed "Stock Status Report". This report will present the quantities on hand, amounts on order, value, and shelf life for each item in inventory. As many as 300 finished products and 1,500 raw ingredients will be located in central facility, satellite facility, or commissary storage areas. The numbers, quantities, and dollars involved obviously present a significant inventory control responsibility.

Management of the proposed food service system will also require analyses designed to anticipate problems or requirements. Long range (one year) dining hall attendance projections, for example, can prove useful in anticipating food requirements. Microbiological and sanitation data can prove useful in anticipating problems if trends rather than pass/fail criteria are reported.

Given the scope of the proposed food service system, it is proposed that the accompanying information system be implemented in phases.

The first step would encompass the installation and operation of an automated headcount system. Machine-readable meal cards would replace the existing DD Form 714. Card readers would be installed in each satellite facility. The readers would be connected thru telephone lines to a central polling station wherein the information encoded on meal cards would be written onto a computer compatible medium such as magnetic tape.

The second and third phases would extend computer applications in areas such as inventory control, production, and distribution, long-term demand forecasting, and quality control trend analyses.

Finally, it is important to note that the computer plays an important role in the proposed information system. While automation of such functions as headcount and inventory control are explicit objectives in the current Army Food Service Program, little has been accomplished in terms of implementation. With the proposed centralized preparation system and reorganization of functions therein, management cannot perform effectively without ADP support along the lines proposed in this report.

There is another aspect of manager's performance which must be kept in mind. Commercial restaurants cater to consumer's needs. The profit motive, and perhaps even

more basically, the manager's needs for economic survival, job security and self-respect assure that consumer's preferences are not disregarded in the operation of the commercial food outlet.

The military food service obviously cannot count upon the profit motive to focus management attention upon consumers. Nor can the profit motive — or any other motive — be created. Motivation is part of the individual — an internal state or states which is or are always present. One task of systems design is, therefore, not to create a particular motive but to construct systems or environments wherein existing motives are more likely to produce desired outcomes than does the present system or environment.

Motives or needs such as the need for achievement, power, recognition, status and esteem are both present and powerful in every individual. By such changes as allowing "free access", reporting performance of one facility against other facilities, and reorganizing food service; the proposed system should create the conditions necessary for food service personnel to be responsive to the modern military consumer.

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Appendix A

ORGANIZATION AND RESPONSIBILITIES

Responsibilities for operation of the proposed system have been allocated to the following individuals and organizational units. Figure A-1 presents an example of the suggested organization structure.

DIRECTORATE OF FOOD OPERATIONS (DFO)

The Directorate has complete responsibility for all subsistence activities of the installation including food service, subsistence, logistics and management of materials, equipment and facilities. The Directorate exercises control over operation of all dining halls in the food service system; establishes and publishes policies and procedures for operating the system; has overall responsibility for the technological aspects of food preservation; and is responsible for maintaining a high degree of customer satisfaction. The responsibility for the financial status and the overall performance of the food system also rests with the Directorate.

SUBSISTENCE REVIEW COMMITTEE (SRC)

The Committee assures that the food service system is responsive to the needs of the customers. Members are appointed by the installation commander. The chairman is the Commanding Officer or his designated staff alternate.

FOOD OPERATIONS DETACHMENT

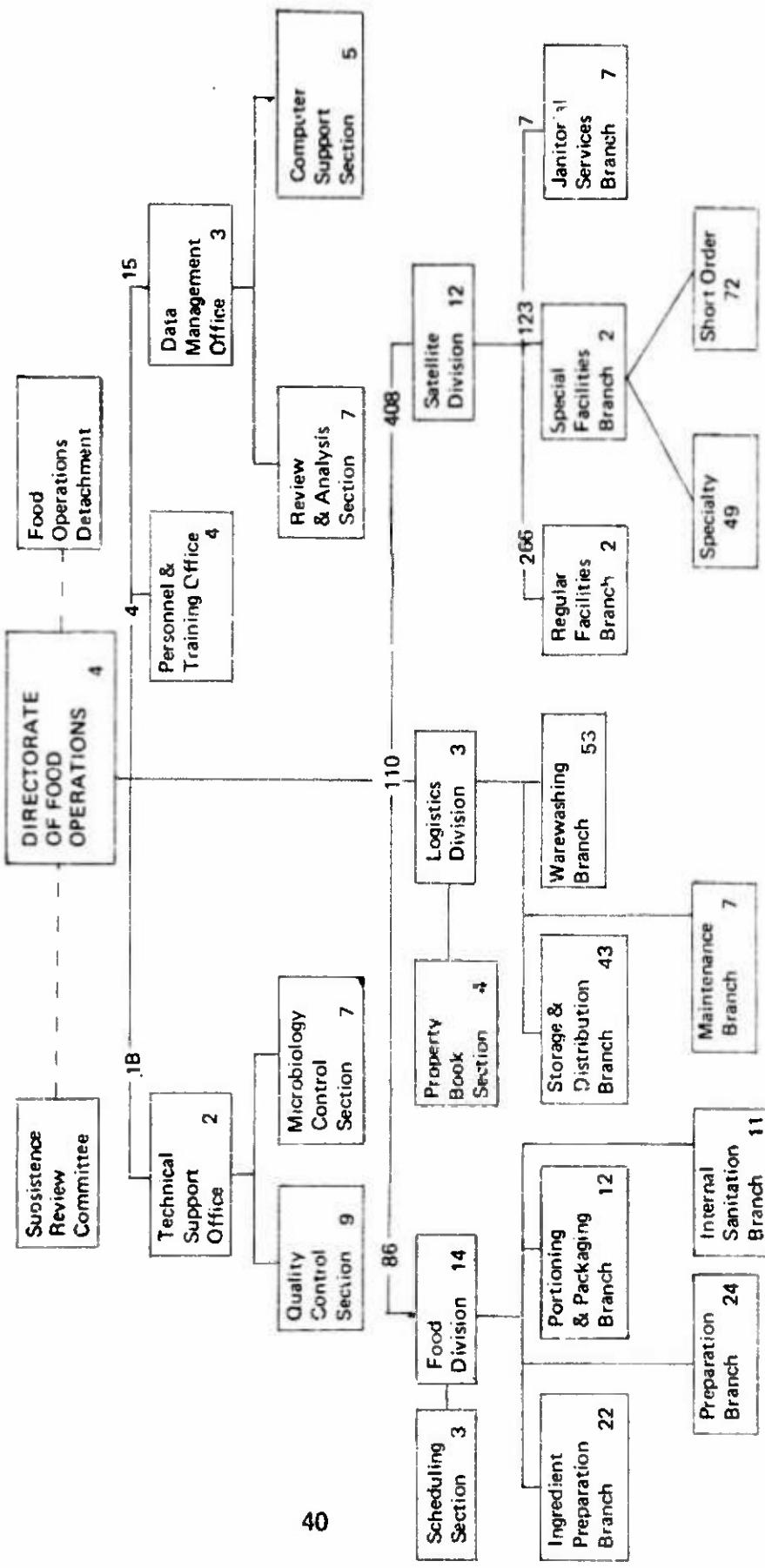
A Food Operations Detachment has command control over all military food service personnel while the supported TO&E units are in garrison. This Detachment is also responsible for transferring the necessary food service personnel to the TO&E units in the event of unit deployment.

TECHNICAL SUPPORT OFFICE

The Technical Support Office operates the quality control and microbiology control sections of the CFPF. This Office plans, directs, and controls a broad program assessing

FIGURE A1

PROPOSED ORGANIZATIONAL STRUCTURE FOR MODERN FOOD SERVICE
SYSTEM CENTRAL FOOD PREPARATION FACILITY



the quality, wholesomeness, utility of the food, food preparation and food service for the Directorate. Additionally, it has major responsibility for the technological aspects of food preservation.

QUALITY CONTROL SECTION

The Quality Control Section has the responsibility for insuring that foods are produced in accordance with the established food product standards. This includes the raw foods and the foods prepared at the CFPF, and recommending corrective action to the DFO when discrepancies are uncovered. The performance of this function requires the following:

- Sample and inspect the food products and conduct physical testing of both raw and processed foods and finished products.
- Conduct organoleptic evaluations of prepared foods both at the CFPF and at the dining halls.
- Adjust recipe formulations, processing procedures, and equipment utilization to correct product quality deficiencies and improve operational efficiency.
- Determine food waste and disposition of rejected, unused or overage food products.
- Perform menu revisions and adjustment for nutritional constraints.
- Conduct inspections of warewashing equipment, dishware and all other items sanitized at the central warewashing facilities.

MICROBIOLOGY CONTROL SECTION

The Microbiology Control Section has the responsibility for maintaining the microbiological safety of all food products in the system. The performance of this function includes the following:

- Conducts all microbiological and chemical sampling and testing. Performs the sanitation inspections and temperature monitoring.

- Operates the laboratory and maintains contact with larger better equipped military laboratories to accomplish tests not within its capability.
- Establishes and maintains a dining hall rating system and conducts organoleptic evaluation of prepared food as it is presented on the serving line.

FOOD DIVISION

This Division is a major operating division, responsible for all food processed centrally including the ingredient preparation, food preparation, portioning and packaging, and internal sanitation activities of the CFPF. The Food Division is composed of the activities outlined below. It should be pointed out that each Branch is responsible for the operation, sanitation and preventive maintenance of the equipment which is assigned to the branch.

Ingredient Preparation Branch. This Branch weighs and measures, tempers, thaws, bones, cuts, washes, trims, prepares, packages, labels, assembles and issues ingredients according to prescribed schedules and recipes. It also maintains separate areas for nonperishables, vegetables, meats, and poultry, and controls the assignment of Branch personnel to minimize cross-contamination.

Preparation Branch. This Branch prepares and cooks all the foods which are processed at the CFPF, supervises work centers which prepare and/or cook, and is responsible for insuring that the foods are cooked at the proper temperatures using established formulations and procedures.

Portioning and Packaging Branch. This Branch portions, fills, combines, pans, bags, and freezes or chills the prepared foods, including the weighing and labeling of the packaged foods.

Internal Sanitation Branch. This Branch is responsible for achieving the standards of cleanliness required in the CFPF.

Scheduling Section. This Section plans and schedules food preparation times and quantities in a manner that will assure a uniformly high level of food quality, minimize food losses, and make effective use of equipment and storage space.

LOGISTICS DIVISION

The Logistics Division is a major operating division responsible for the storage and distribution of all food products and the washing and distribution of all dishware utilized by the dining halls. The following is a list of the functions performed by the various Branches of this Division.

Storage and Distribution Branch. This Branch requisitions, receives, stores, issues and inventories perishable and nonperishable foods and tableware supplies. This also includes the assembly of food products for distribution to the dining halls as well as receiving raw ingredients at the CFPF. This Branch is also responsible for the development and maintenance of the delivery and pickup schedules for the dining halls.

Warewashing Branch. This Branch washes, sterilizes, and sorts all tableware, trays, racks, transporters, and silverware used by the dining hall. It is responsible for the continuous inspection of all washed items to insure cleanliness.

SATELLITE DIVISION

This Division is a major operating division, responsible for the management and operational control of all satellite dining halls and including inventories and assignment of personnel. It has major responsibility for promoting consumer acceptance and increasing dining hall attendance. This Division also maintains an operational field kitchen for training purposes and provides field food service, as required.

Regular Facilities Branch: This Branch supervises all the regular A-ration dining facilities on the installation. It insures that foods are received, stored, prepared and displayed in a manner that will meet sanitary and nutritional standards and encourage a high degree of consumer acceptance. It also assures that established headcount procedures are followed, and monitors stock rotation and turn-in of unused food/ingredients.

Special Facility Branch: This Branch supervises all the short order and specialty facilities on the installation. It insures that foods are received, stored, prepared and displayed in a manner that will meet sanitary and nutritional standards and encourage a high degree of consumer acceptance. It also assures that established headcount procedures are followed, and monitors stock rotation and turn-in of unused food/ingredients.

DATA MANAGEMENT OFFICE

The Data Management Office is responsible for assuring that formal management information requirements are met. This task includes such activities as:

- a. maintaining data files
- b. processing reports by running computer programs or by manual statistical tabulations
- c. assuring that input data is received and prepared in prescribed formats.

These activities will be performed primarily in the Computer Support Section.

The Data Management Office will also perform consumer surveys and relevant data analyses as part of the Review and Analysis Section's function. This section will also assume responsibility for auditing records, reporting accounting irregularities (e.g. meal card duplications), and such other tasks as are necessary to maintain effective internal controls.

Appendix B

DATA FILES REQUIRED IN THE PROPOSED MANAGEMENT INFORMATION SYSTEM

As suggested in Exhibit 3-1, several major input files will be required in the proposed information system. The purpose of this appendix is to present the specific kinds of data included in each of the major input files.

Headcount File: The principle types of data in the proposed headcount file are:

- a. Individual identifier (Social Security Number)
- b. Individual's command unit assignment
- c. Date
- d. Time
- e. Satellite Facility identifier (e.g. building number)

Readers familiar with the existing system will recognize some of this information as that contained on DA Form 3351 "Signature Headcount Sheet". Using the proposed automated headcount system, the date and time would be automatically added to each record created by insertion of meal cards in satellite facility card readers. This data would permit computerized preparation of Satellite Performance Reports, (Exhibit 3-2), unusual meal card usage reports, and assuming proper authorization, cash meal invoices.

Although not considered a major requirement, some information must be collected and maintained in order to control meal card issues. For this purpose, a "meal card account" file could be established. The file would contain such data as:

- a. Name and signature
- b. Social Security Number
- c. Transaction code (first issue, reported loss, replacement)
- d. Transaction date.

Menu Recipe File: One of the basic files required in such functions as ordering and preparing food is a menu/recipe file. Structurally, these may be separate or merged together. In either case, the primary data in this file(s) will be:

- a. Food items name
- b. Menu day upon which item appears
- c. Food item identification code (e.g. recipe number)
- d. Ingredient names
- e. Ingredient code number (e.g. Federal Stock Number)
- f. Ingredient gross weights required for one hundred servings
- g. Ingredient net weight required for one hundred servings (net weight is the gross weight less waste from such operations as peeling or dicing)
- h. Preparation code (indicating whether item is prepared in the central or satellite facility or both)
- i. Maximum production batch size
- j. Cooking instructions
- k. Expected yield
- l. Equipment required in preparing product.

As was the case with headcount data, the information requirements presented above are largely available in the current system. Present standard recipe cards, in fact, contain most of the above data. The proposed information system seemingly adds information such as menu day (b) or equipment required (1) to existing recipe cards, and maintains this file on computer-compatible media. Programs such as those utilized during CAFE operations at Fort Lewis would be utilized to prepare computerized "Ingredients Issue Production Guides", and "Production Reports" (Exhibits 3-5 and 3-6).

Food Choice Preference File: In order to attract consumer's menus must reflect food preferences to some – perhaps considerable – extent. Using periodic food preference questionnaires and food choice data collected in satellite facilities, management of the proposed food service system will be able to adjust menus to suit particular consumer desires. The relevant data with respect to food choices are:

- a. Individual identifier (e.g. Social Security Number)
- b. Date

- c. Time
- d. Coded food item choice #1 (e.g. roast beef)
- e. Coded food item choice #2 (e.g. mashed potato)
- f. Coded food item choice #3 (e.g. tossed salad)
- g. Coded food item choice #4 (e.g. apple pie)

The consumer's food preferences would be measured by questionnaire or other survey methods. File contents and structure thus will vary as a function of specific survey designs. The data should, however, reflect food preference ratings and the desired frequency of menu offerings.

Inventory files: Each separate shipment of raw ingredients and each item produced in the central facility must be recorded in inventory files. There will be as many as 1,500 different raw materials and 300 finished goods. Three types of transactions can occur with respect to each item: receipt, transfer, issuance. While inventory control and accounting is, in the existing food service system, largely a manual process, the proposed system assumes a substantial amount of computer processing.

Data required in inventory control, hence the elements comprising an inventory file, encompass the following:

- 1. item code
- 2. raw material/finished good code
- 3. item description (noun name)
- 4. unit of issue.

With respect to raw ingredients, the inventory file must contain:

- 1. date received
- 2. quantity
- 3. location of stock
- 4. unit cost
- 5. supplier
- 6. quality rating
- 7. expiration date

For centrally processed materials, the inventory file should contain:

1. batch number
2. date of production
3. unit
4. quantity
5. location of stock
6. returned/original product
7. rework/available for consumption
8. expiration date

Inventory files will be updated daily to reflect one or more of the following events:

1. items ordered
2. items received or produced
3. items issued from inventory
4. adjustments reflecting physical inventory results
5. order cancellations

Troop Strength File: In order to anticipate long term (e.g. one year) food requirements, it is necessary to know how many consumers may be added to or subtracted from the existing base population. These data are available from Force Development and should be incorporated into the proposed food service system's data base.

Cost File: Management in the proposed system will require the following kinds of data in order to fully analyze operating costs:

1. Accounting code (e.g. food item #, supply #)
2. Expected/standard or average food item cost (for centrally processed items)
3. Purchase cost (for raw ingredients) or actual cost (for centrally processed items)
4. Equipment item and cost
5. Hours worked and pay grades
6. Benefits and related overhead costs

Quality Control File: Experience gained during the CAFE operations suggests that large amounts of microbiological, organoleptic and sanitation data will be accumulated in efforts to assure that high quality food is prepared and served in clean environments. The following kinds of data will be captured and maintained as a result of quality control activities:

1. Identification code (e.g. food item #, equipment number or type)
2. Cooking times and temperatures, prescribed and actual
3. Results of microbiological food sample tests
4. Taste test panel ratings
5. Quality ratings of raw ingredients and finished products
6. Date, time and location of test or sample.

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